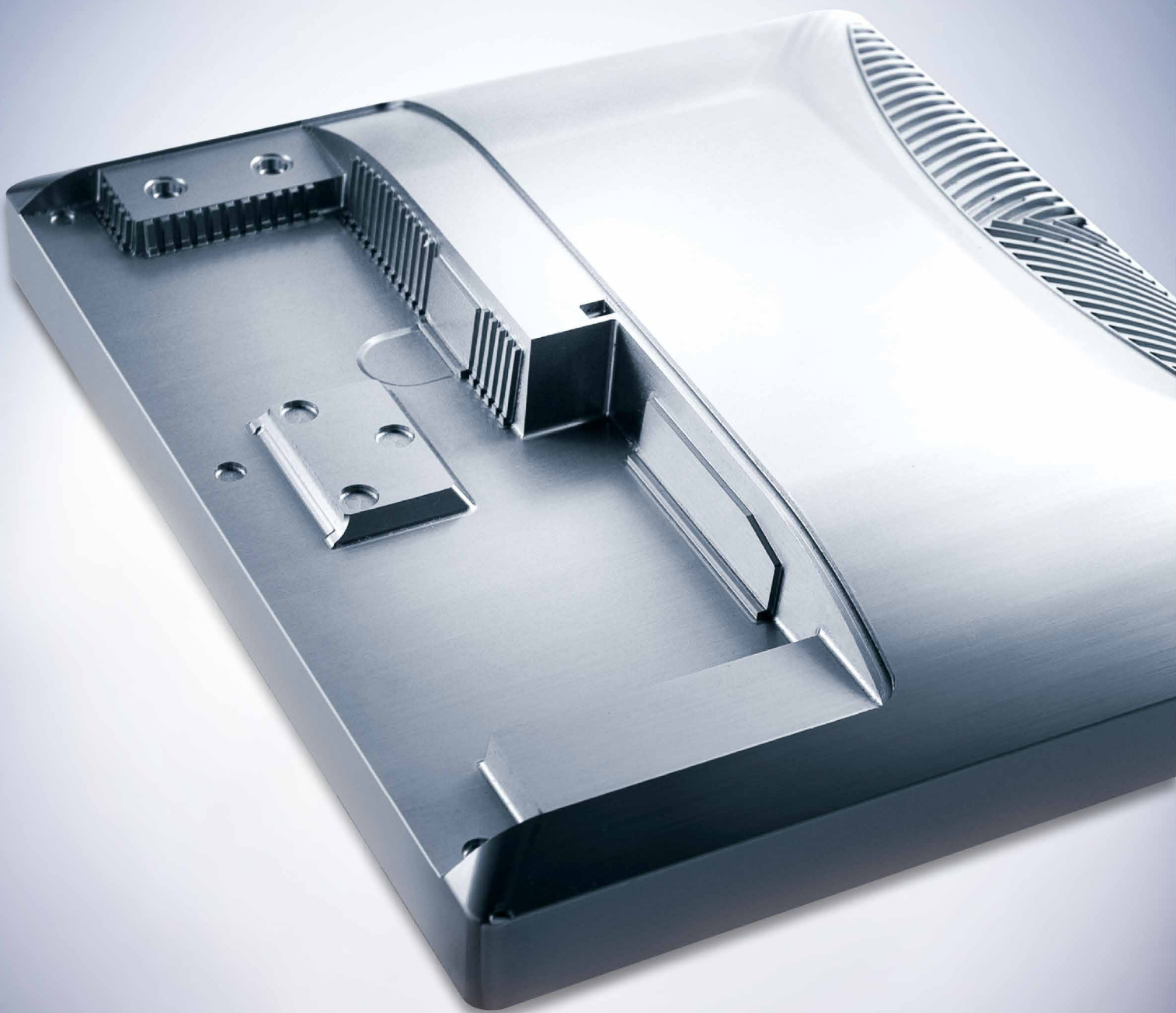




M2-5AX

Total Solution 5-Axis Universal Machining Center



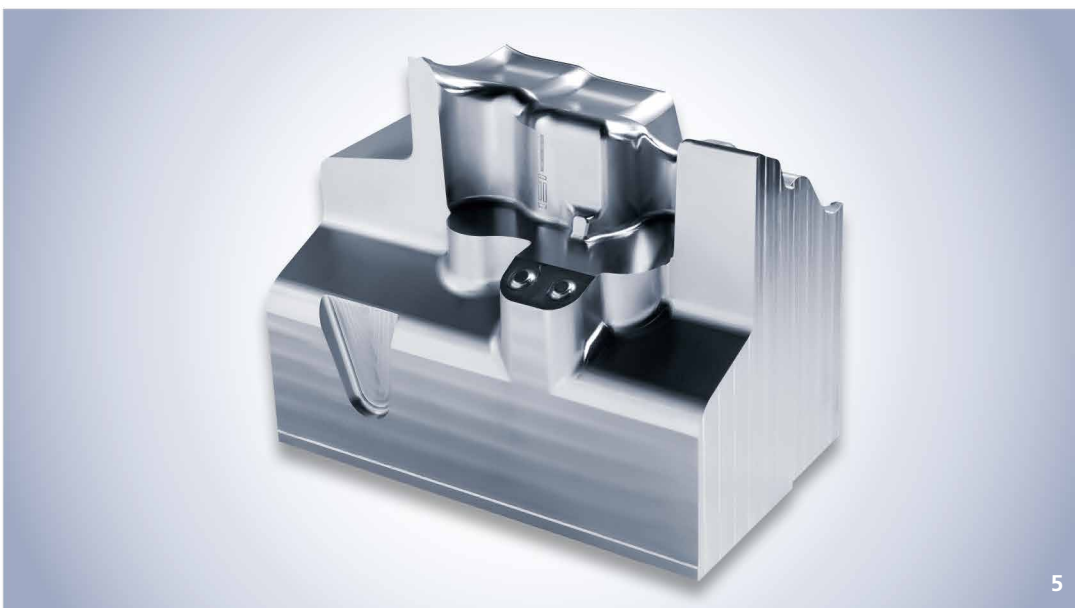


5-AXIS UNIVERSAL MACHINING CENTER WITH TOTAL SOLUTION

This highly precise machining center is capable of performing 5-axis machine on entire production process with a single setting

Hwacheon M2-5AX can work on a complex workpiece which requires many different production processes with just a single setting. Coupled with the Hwacheon Total Solution, it is the ultra-precision 5-axis production solution you've been looking for everything from tool selection to final product.

1 LCD Back Cover (Core) / Home appliances / NAK80 2 Mission Case / Automobile / KP4M 3 Head Lamp / Automobile / KP4M
4 Part or Head Light / Automobile / KP4M 5 Slide Core / Automobile / KP4M



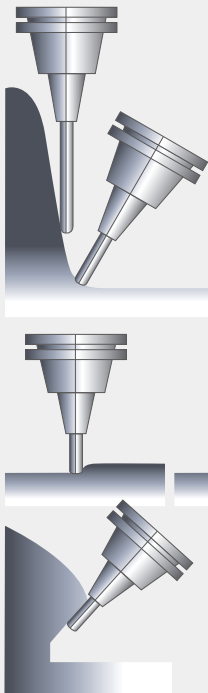
HWACHEON TOTAL SOLUTION MEETS MACHINING EXCELLENCE

Find out what we mean by machining optimization

Hwacheon's universal 5-axis center gives you the total machining solution- everything from tool selection to final product.

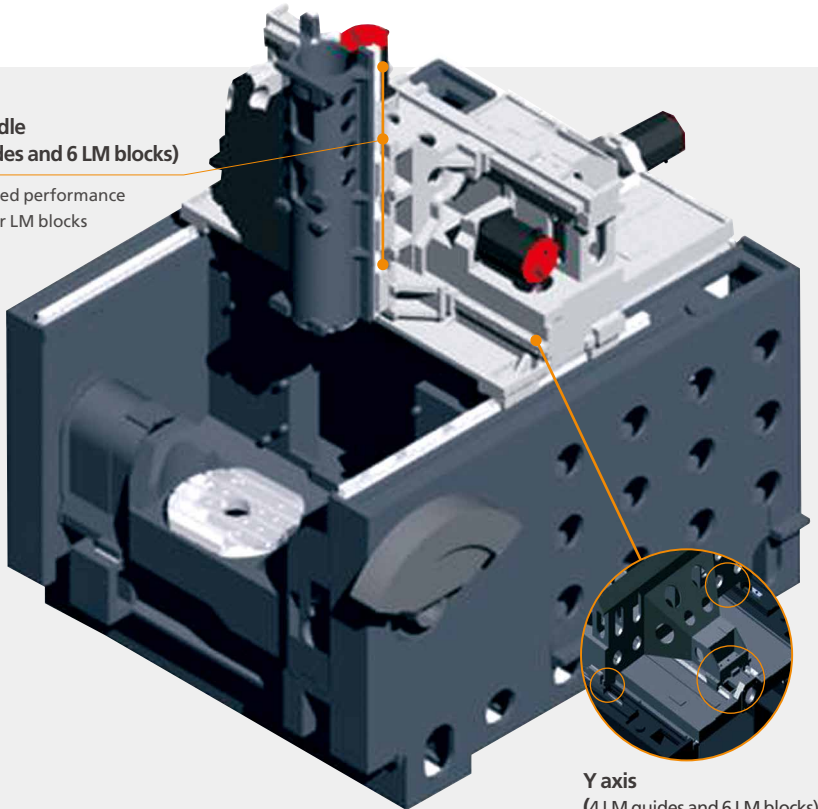
Also, the Machining Optimization system configures itself to fit your machining condition and application to give you the best product result. The 2-axis rotary table at $\varnothing 500$ lets you create a product either by 5-axis or 3+2 axis processing method. M2-5AX is built from 3D FEM analysis, and the software components specially created in-house by Hwacheon will increase the machine's productivity and process speed. The machine comes with many functional options that will make your production more efficient.





**Z-axis saddle
(2 LM guides and 6 LM blocks)**

Powerful feed performance
from 6 roller LM blocks



**Y axis
(4 LM guides and 6 LM blocks)**

Highly efficient multi-axis machining

Not only can a 5-axis machine move in the same three directions of a 3-axis machine, but the cutting tool can also rotate to approach the work from any direction, enabling easy access to the undercuts that a 3-axis machine can't reach. Also, the end mill sweeping provides significant savings in machining time up to one fifth of the time it would take for the ball-end mill to be fed back and forth along a curvilinear path at close intervals when producing complex three-dimensional surfaces. Another benefit behind a 5-axis system is that the length of the tools can be compact, which used to be made longer to match the size and shape of workpieces; and the cutting is done with the side of the ball end mill, not just with the tip of it, which increases the life of the tool and results in the cut surface that is ultra fine.

Spindle assembly

The Hwacheon clean room assembly facility, where the super-precision, super-speed spindle built inside M2 is manufactured, maintains optimal temperature and humidity, and is kept free of any foreign substances. Only the most skilled master engineers are allowed in the assembly facility, in the production of only the best equipment to comply with the toughest quality standard in the industry.

Oil-jet Cooling System

The jet of oil is injected directly onto the spindle bearing for effective cooling, and the motor and the spindle assembly are jacket-cooled to limit the displacement caused by heat.

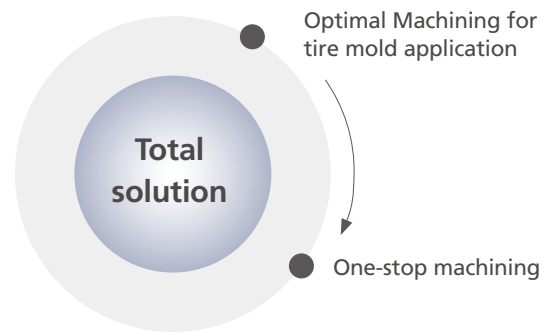
High-precision gantry design

The base frame includes two wide columns to achieve unibody stability, and the machine has adopted the gantry-type feed drive whose axial system travels over the base frame in three different directions along the X, Y, and Z axes. This design helps the machine to maintain rapid yet precise feedrate, and constant control performance regardless of the workpiece. The Z axis is firmly supported by 6 LM blocks; and for the Y axis, 6 LM blocks are triangle-positioned on 4 rails, in attempt to maximize feed drive rigidity.



UTILIZATION OF OPTIMAL MACHINING SYSTEM FOR THE CREATION OF TIRE MOLD

“Optimal Machining” is a part of Hwacheon’s Total Solutions, and the Optimal Machining System increases the productivity by up to 200%. From setting up a tire mold to quality inspection, the whole process can be achieved in one stop process. This was made possible with the creation of proprietary machining software for the purpose of making tire molds. The result Lowered worker dependency and defect rate; and increased product quality and productivity.

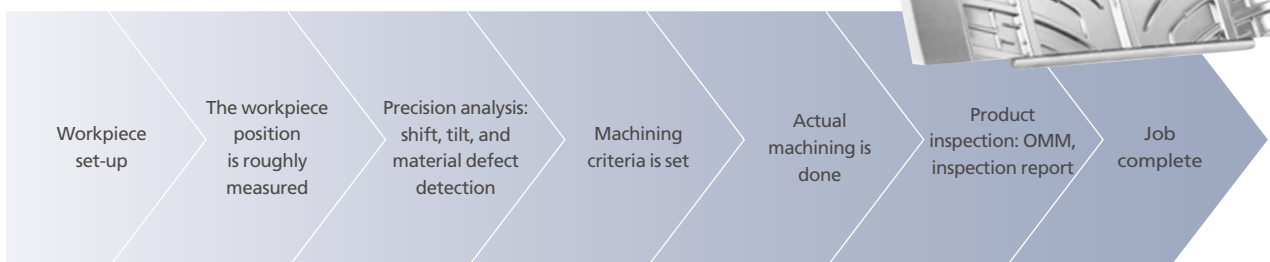


1 Benefits

- Increased productivity with "One-stop Machining."
- Set-up is easy even for the most complex shaped workpiece.
- Less dependent on the operator's skill
- Less work load per worker = increased productivity
- Defects are easily identified and found
- Reduced product defect

2 Process

In the tire mold machining process using a 5-axis machine, a casting material is virtually measured, and then the setup deviation is automatically calculated and corrected before actual machining.





MACHINING SOFTWARE

The Hwacheon Machining Software Components

The Hwacheon's developed machining software monitors different variables related to the work environment and machining conditions automatically makes adjustments for best quality results and optimum work efficiency.

+ RELIABILITY

HRCC

Hwacheon Rotation Center Calibration System

Hwacheon's Rotation Center Calibration System automatically measures and sets the reference point of pivot in a 5-axis machine in under one minute, to lower the workpiece setup time and increase the machining quality. The system also creates and manages a database of the reference points for different temperature and time to limit the deviation of the rotation center.



HSDC

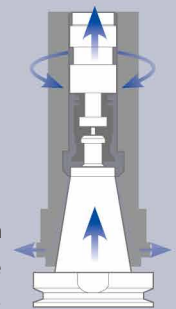
Hwacheon Spindle Displacement Control System

When the spindle rotates at high speed, the centrifugal force drives the taper to expand, causing errors in Z axis. HSDC constantly monitors the temperature at each spindle region and makes optimal prediction for thermal displacement. The system then makes necessary adjustments and effectively minimizing thermal displacement.



Static displacement compensation

The HSDC system corrects the Z-axis error occurring from the taper expansion during the spindle's high speed rotation.



PRECISION +



HTLD

Hwacheon Tool Load Detect System

HTLD constantly monitors the tool wear to prevent accidents, which may occur from a damaged tool and help to stop tool wear from deteriorating the workpiece. (The load is measured every 8 msec to ensure accuracy)



HECC

Hwacheon High-Efficiency Contour Control System

HECC offers an easy-to-use programming interface for different work-pieces and different processing modes. The system provides a precise, custom contour control for the selected workpiece, while prolonging the life of the machine and decreasing process time. The customizable display provides real-time monitoring and quick access.

- Program offers different options for different cutting speed accuracy and for roughness and shapes.
- The customizable display provides real-time monitoring and quick, easy access.
- The program is executable on an existing NC DATA system and works with the G Code system.



OPTIMA

Cutting Feed Optimization System

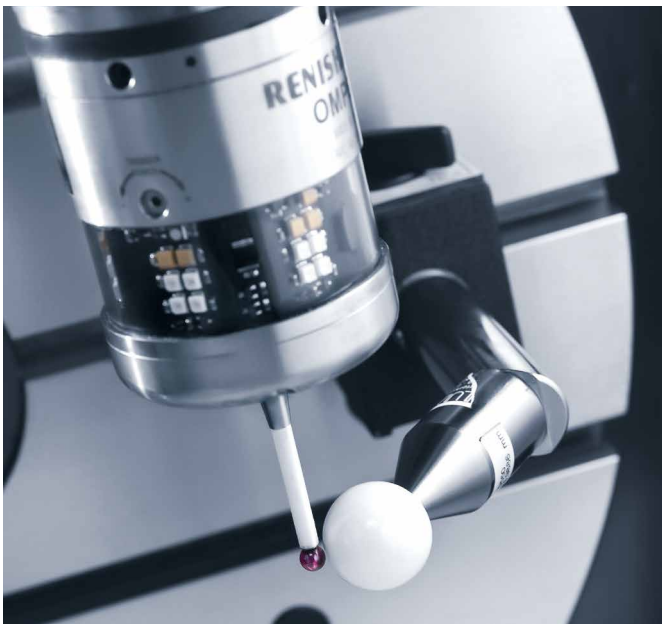
OPTIMA utilizes an adaptive control method to regulate the feed rate in real time, to sustain the cutting load during a machining process. As a result the tools are less prone to damage and the machining time is reduced.



SPEED +

USER FRIENDLY DESIGN, A WIDE RANGE OF OPTIONAL FEATURES

M2-5AX offers user friendly design and a wide variety of useful options for practical applications, so you can concentrate on what you do best: creating quality products- without losing your valuable time to the worries of machine failure and safety. A wide variety of performance upgrade options are available for faster, more precise machining.



Hwacheon Rotation Center Calibration System-HRCC (Option)

Hwacheon's Rotation Center Calibration System automatically measures and sets the reference point of pivot in a 5-axis machine in under one minute, to lower the workpiece setup time and increase the machining quality. The system also creates and manages a database of the reference points for different temperature and time to limit the deviation of the rotation center.

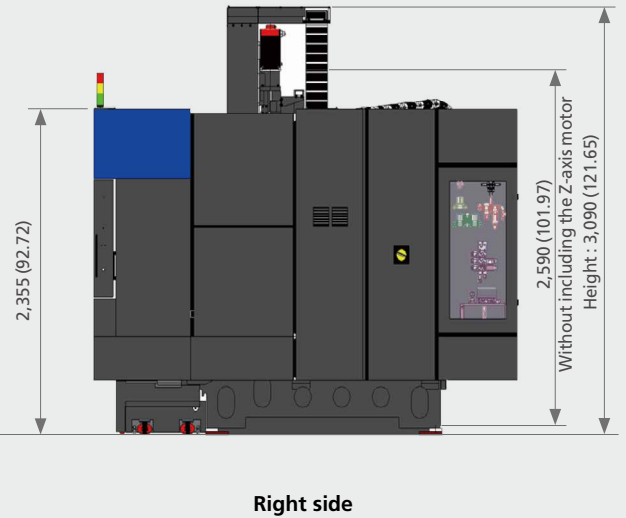
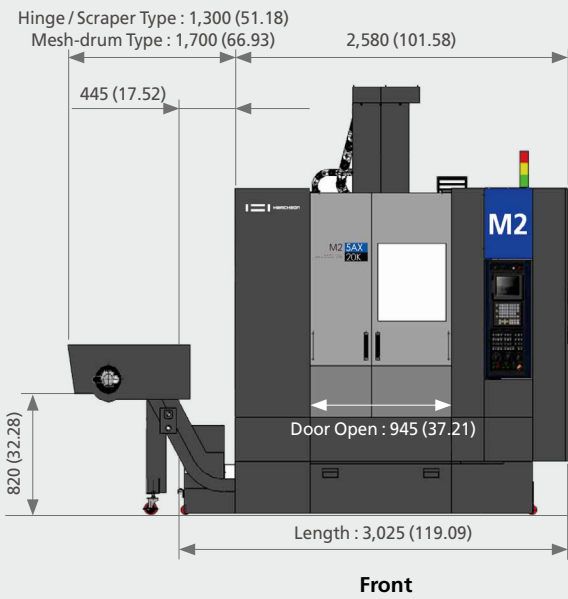
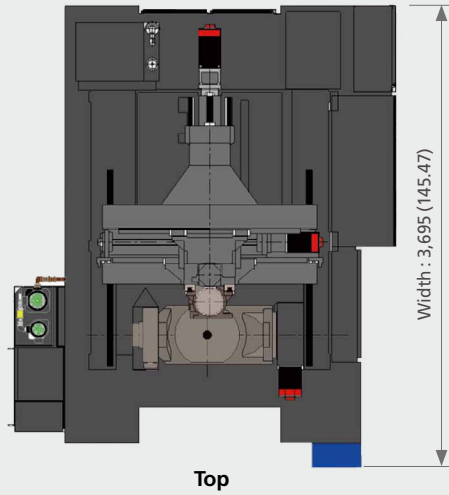


2-Axis Tilting rotary table for extra stability

The 2-axis rotary table secured on top of the base frame is installed separately from the gantry-type X, Y, Z 3-axis feed drive to rotate the workpiece uninterrupted from the rapid on the linear axis. The fixed OTT worm gears and rotary encoder allow for 0.001 degree of high-precision angle division and consecutive rotation cut; and the powerful hydraulic brake system with 4,670Nm of force provides the rigidity more than sufficient for any 3+2 axis job. As an option, the table can incorporate up to 6 grooves for hydraulic and air tubing, to make it easy to integrate gantry robotics to M2-5AX in your automated production line.

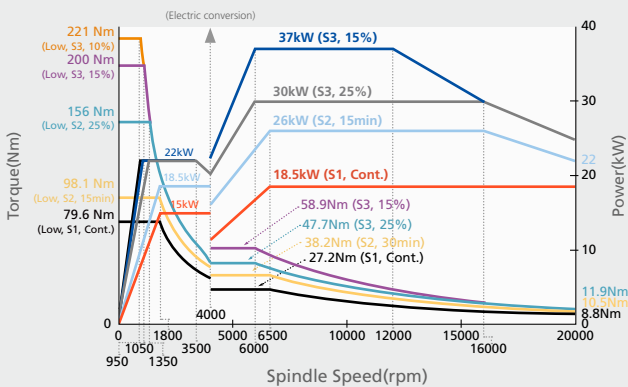
Product data

* Unit: mm(inch)

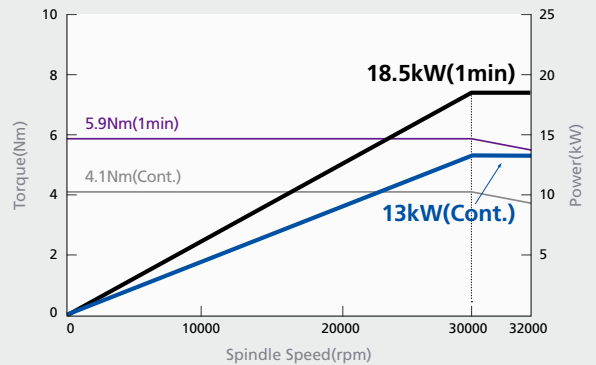


Spindle power – torque diagram

Standard (20,000rpm)

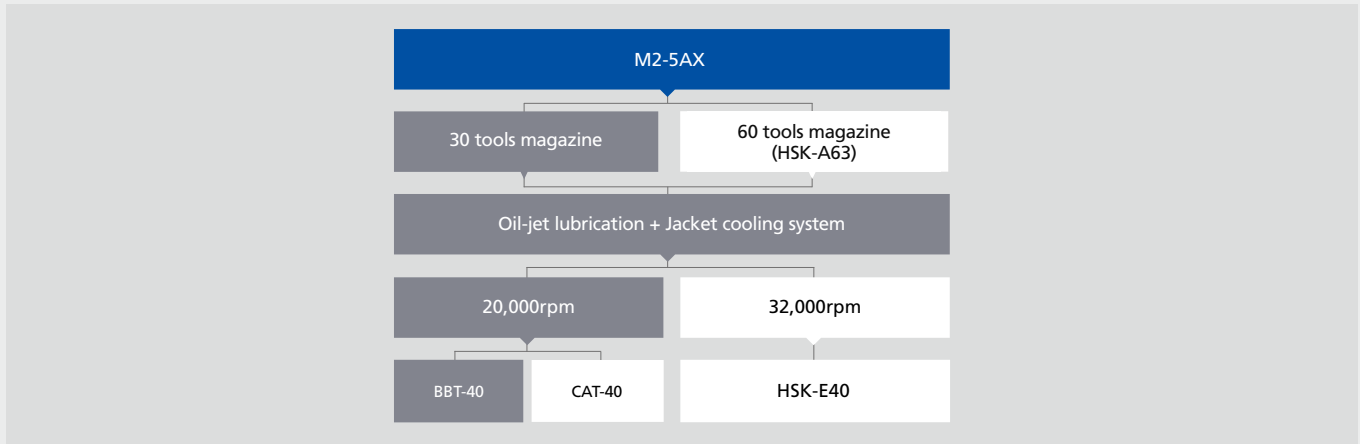


Option (32,000rpm)



Product Configuration

Each product can be configured to fit your application.



Machine Specifications

ITEM	M2-5AX		
		20,000	32,000
Travel			
Stroke (X / Y / Z)	mm(inch)	750 (29.53") / 650 (25.29") / 500 (19.69")	
Tilting(A) / Rotation(C)	degree	(+) \pm 30 ~ (-) \pm 120 / 360	
Distance from table surface to spindle gauge plane (Long nose type)	mm(inch)	75 (2.95") ~ 575 (22.64")	
Table			
Working surface	mm(inch)	\varnothing 500 (19.69")	
Table loading capacity	kg _f (lb _f)	300 (661.39)	
Table surface configuration (T slots WxP – No. of slots)	mm(inch)	14 (0.55") x 80 (3.15") - 5ea	
Spindle			
Max. Spindle speed	rpm	20,000	32,000
Spindle Motor	kW(HP)	37 / 18.5 (50 / 25)	18.5 / 13 (25 / 18)
Feedrate			
Rapid Speed (X / Y / Z)	m/min(ipm)	50 (1,969) / 50 (1,969) / 50 (1,969)	
Rapid Speed (A / C)	rpm	8.3 / 33.3	
Feedrate (X / Y / Z)	mm/min(ipm)	1 (0.04) ~ 24,000 (945)	
ATC			
Type of tool shank	-	BBT-40 (Standard : 30 tool) (Opt. : CAT-40, HSK-A63)	HSK-E40
Type of pull stud	-	MAS P40T-1 (45°)	
Tool storage capacity	ea	30(Opt. : 60)	
Max. Tool diameter [without adjacent tools]	mm(inch)	\varnothing 80 (3.15") / \varnothing 170 (6.69")	\varnothing 60 (2.36") / \varnothing 90 (3.54")
Max. Tool length	mm(inch)	300 (11.81")	250 (9.84")
Max. Tool weight	kg _f (lb _f)	8 (17.64)	3 (6.61)
Tool changing time (T to T / C to C)	sec	1.5 / 4	2.5 / 5
Motor			
Feed motor (X / Y / Z)	kW(HP)	4.0 (5.4) / 7.0 (9.4) / 4.0 (5.4)	
Feed motor (A / C)	kW(HP)	4.0 (5.4) / 4.0 (5.4)	
Coolant motor (Spindle)	kW(HP)	0.4 (0.54) / 0.9 (1.20)	
Spindle cooler (50 / 60Hz) – Inverter type	kW(HP)	5.0 (6.70) / 5.6 (7.51)	8.0 (10.72) / 9.0 (12.06)
Power Source			
Electric power supply	kVA	65	
Compressed air supply (Pressure x Consumption)	-	0.5 ~ 0.7MPa x 690N ℓ /min	
Tank capacity			
Spindle cooling / Lubrication / Hydraulic	ℓ (gal)	60 (15.85) / 12 (3.17) / 20 (5.28)	
Coolant	ℓ (gal)	400 (105.67)	
Machine size			
Height	mm(inch)	3,090 (121.65")	
Floor space (length x width)	mm(inch)	3,025 (119.09") x 3,695 (145.47")	
Weight	kg _f (lb _f)	11,000 (24,251)	
NC controller		Fanuc 31i-B5	

Standard and Optional product components

Standard Accessories		Optional Accessories	
•Adjust Bolt, Block & Plate	•Tilted working plane command with guidance for 5 axis	•Air Dryer	•Mist collector
•Air Blower	•Tool kit & box	•Air Gun	•Oil skimmer
•Base around Splash guard	•Workpiece Coordinate System (48ea)	•Auto Door	•Oil mist (Semi dry cutting system)
•Coolant System	•Work Light	•Addition of Jig and fixture hydraulic groovings for rotary table (4 / 6part)	•Coolant through spindle (3MPa / 7MPa)
•Data Server (256MB)	•Hwacheon Efficient Contour Control System (HECC)	•BBT Spindle	•Transformer
•Door Interlock	•Hwacheon Spindle Displacement Control System (HSDC)	•Coolant Gun	•Tool life management
•Hydraulic System	•Hwacheon Tool Load Detect System (HTLD)	•CNC-integrated 3-dimensional interference check system	•Tool measuring system-Renishaw / Blum (Touch type, Laser type)
•Lubrication System	•Cutting Feed Optimization System (OPTIMA)	•Data server (1,024MB)	•Tool radius compensation for 5 axis
•MPG Handle (1ea)	•Hwacheon Artificial Intelligence Control System(HAI) 600 Block	•Data server Interface	•Workpiece measuring system-Renishaw / Blum (Touch type)
•Operation manual & parts list	•Smooth Tool Center Point Control	•Lift up chip conveyor (Hinge type, Scraper type, Mesh-drum type)	•Hwacheon Rotation Center Calibration System (HRCC) - Include work measuring system-Renishaw (touch type)
•Pneumatics System	•10.4" Color LCD	•NURBS Interpolation	•Hwacheon Artificial Intelligence Control System (HAI) 1000 Block
•Rigid tapping		•Nano Smoothing Interpolation	
•Scale (X / Y / Z / A / C)		•NC Cooler	
•Signal Lamp (R / G / Y, 3 color)			
•Spindle cooler			

NC Specifications [Fanuc 31i-B5]

※ — : Not available S : Standard O : Option

ITEM	SPECIFICATION		ITEM	SPECIFICATION	
Controlled axis			Programmable Mirror Image		O
Controlled axis	5 - Axes	S	Tape format for Fanuc series 15		O
Simultaneously controlled axes	5 - Axes	S	Spindle speed function		
Least input increment	0.001mm, 0.001deg, 0.0001inch	S	Spindle override	50 - 120%	S
Least input increment 1 / 10	0.0001mm, 0.0001deg, 0.00001inch	O	Spindle orientation		S
Inch/metric conversion	G20, G21	S	Rigid tapping		S
Store Stroke Check 1 / 2		S	Tool function / compensation		
Mirror Image		S	Tool function	T4 - digits	S
Operation			Tool offset pairs	±6 - digits 200ea	S
Automatic & MDI operation		S	Tool offset pairs	±6 - digits 400ea, 999ea	O
DNC operation by memory card	PCMCIA card is required	S	Tool offset memory C		S
Dry Run, Single Block		S	Cutter compensation C		S
Manual handle feed / feed rate	1Unit / x1, x10, x100	S	Tool life management		O
Interpolation function			Tool length compensation / Tool length measurement		S
Positioning / Linear interpolation / Circular interpolation / Dwell (Per seconds)	G00 / G01 / G02,G03 / G04	S	Editing operation		
Helical interpolation	Circular interpolation plus max.2axes linear interpolation	S	Part program storage length / Number of register able programs	256kB / 500ea	S
Nano Smoothing		O	Part program storage length / Number of register able programs	512kB/ 1,000ea 1MB / 1,000ea, 2MB / 1,000ea	O
Reference position return check / return	G27 / G28, G29	S	Background editing / extended editing functions		S
2nd reference position return	G30	S	Play Back		O
Skip	G31	S	Setting and display		
NURBS interpolation (64Bit RISC board is required)		O	Display unit	10.4" Color LCD	S
Feed function			Clock function		S
Rapid traverse override	F0, F25, F50, F100	S	Self-diagnosis function / Alarm history display		S
Feedrate (mm/min)		S	Help function / Graphic function		S
Feedrate override	0 ~ 150%	S	Run hour and parts count display		S
Jog feed override	0 ~ 4,000mm/min	S	Dynamic graphic display		O
Override cancel	M48, M49	S	Multi-language display	English, German, French, Italian, Chinese, Spanish, Korean, Portuguese, Polish, Hungarian, Swedish, Russian	S
Program input			Data input / output		
Optional block skip	1ea	S	Reader / Puncher interface CH1	RS232C	S
Program number	O4 - Digits	S	Data server	256MB	S
Sequence number	N8 - Digits	S	Data server	1,024MB	O
Decimal point programming		S	Ethernet interface / Memory card interface		S
Coordinate system setting	G92	S	Auto Data Backup	SRAM + Part Program	S
Workpiece coordinate system	G54 - G59	S	HWACHEON Machining Software		
Workpiece coordinate system preset		O	Hwacheon Artificial Intelligence Control System (HAI) 600 Block Buffer		S
Addition of workpiece coordinate pair	48ea	S	Hwacheon Artificial Intelligence Control System (HAI) 1000 Block Buffer		O
Addition of workpiece coordinate pair	300ea	O	Hwacheon Efficient Contour Control System (HECC)		S
Manual absolute on and off		S	Hwacheon Tool Load Detect (HTLD)		S
Chamfering / corner R		S	Cutting Feed Optimization System (OPTIMA)		S
Programmable data input	G10	S	Hwacheon Spindle Displacement Control System (HSDC)		S
Sub program call	10 folds nested	S	Hwacheon Rotation Center Calibration System (HRCC)		O
Custom Macro B		S	5-axis native functions		
Addition of custom macro common variables	#100 - #199, #500 - #999	O	Smooth tool center point control for 5-axis		S
Canned Cycles for Drilling		S	Tilted working plane command for 5-axis		S
Small-hole peck drilling cycle		O	Workpiece setting error compensation for 5-axis		S
Automatic corner override		O	Tool radius compensation for 5 axis		O
Feedrate clamp based on arc radius		S			
Scaling		O			
Coordinate system rotation		S			
Polar Coordinate System		O			

Hwacheon Global Network

 Hwacheon Headquarters  Hwacheon Europe  Hwacheon Asia  Hwacheon America



Please contact us for product inquiries.

www.hwacheon.com

The product design and specifications may change without prior notice.
Read the operation manual carefully and thoroughly before operating the product,
and always follow the safety instructions and warnings labels attached on the surfaces of the machines.

HEAD OFFICE

HWACHEON MACHINE TOOL CO., LTD.

123-17, HANAMSANDAN 4BEON-RO, GWANGSAN-GU, GWANGJU, KOREA
TEL: +82-62-951-5111 FAX: +82-62-951-0086

SEOUL OFFICE

46, BANGBAE-RO, SEOCHO-GU, SEOUL, KOREA
TEL: +82-2-523-7766 FAX: +82-2-523-2867

USA

HWACHEON MACHINERY AMERICA, INC.

555 BOND STREET, LINCOLNSHIRE, ILLINOIS, 60069, USA
TEL: +1-847-573-0100 FAX: +1-847-573-9900

SINGAPORE

HWACHEON ASIA PACIFIC PTE. LTD.

21 BUKIT BATOK CRESCENT, #08-79 WCEGA TOWER,
658065, SINGAPORE
TEL: +65-6515-4357 FAX: +65-6515-4358

VIETNAM

HWACHEON MACHINE TOOL VIETNAM CO., LTD.

UNIT 507, 5TH FLOOR, LOT T2-4, D1 ROAD, SAIGON HI-TECH PARK,
TAN PHU WARD, DISTRICT 9, HO CHI MINH CITY, VIETNAM
TEL: +84 (0)28-2253-2613 FAX: +84 (0)28-2253-2614

GERMANY

HWACHEON MACHINERY EUROPE GMBH

JOSEF-BAUMANN STR. 25, 44805, BOCHUM, GERMANY
TEL: +49-234-912-816-0 FAX: +49-234-912-816-60

INDIA

HWACHEON MACHINE TOOL INDIA PTE. LTD.

103, GULMOHAR CENTRE POINT, 34/A, WADGAON SHERI,
PUNE 411 014, INDIA
TEL: +91-20-6560-0168

CHINA

HWACHEON MACHINE TOOL CHINA CO., LTD.

B03A LIANGUAN JUHE INTERNATIONAL HARDWARE CITY, NO.
143 ZHENANZHONG ROAD, JINXIA, CHANGAN TOWN,
DONGGUAN CITY, GUANDONG PROVINCE, CHINA #523852
TEL: +86-769-8932-0601 FAX: +86-769-8932-0602